

ATTACHMENT 4

EPA Proposal for Regional Temperature Criteria Development Project (June 25, 1999 draft).

Background:

The U.S. EPA, Region 10 has completed Endangered Species Act (ESA) consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (Services) on Oregon's temperature standard. The Services, EPA, and the Oregon Department of Environmental Quality (DEQ) have agreed to a two-year regional temperature criteria development process to address issues raised in the biological assessment and biological opinion. The intent of this effort is two-fold: (a) to develop EPA regional temperature criteria that meets the biological requirements of listed salmonid species for survival and recovery pursuant to ESA and the Clean Water Act (CWA), and can be reasonably implemented; and (b) expected criteria adoption by EPA Region 10 Pacific Northwest states and tribes. Additionally, as EPA headquarters will be undertaking a review of the national temperature criteria guidance, our regional effort will be a pilot to refine and inform national issues.

This effort builds upon past work including studies and reviews conducted by the National Academy of Sciences and those sponsored by states and tribes. For instance, Oregon DEQ completed a technical review of thermal effects on native salmonids during the 1992-1994 water quality standards review. The recommendations of Oregon's temperature subcommittee will aid in our work as we review new data. Geographically diverse thermal regimes, hydrogeological constraints, zoogeography and salmonid life history patterns will be reviewed for criteria development. Although this criteria development effort may well serve as a context for interpreting the link between habitat and biology, this project should not be construed as a process to develop habitat criteria or to establish habitat related optimums. Diagnostic criteria related to habitat attributes should be developed at an appropriate scale using suitable stratification, monitoring, and analysis processes. Where connections exist between this project and ongoing state and tribal efforts, coordination will occur.

This effort differs from past EPA criteria development approaches in that we will focus regionally, and will broaden the scope to specifically address pervasive and persistent effects associated with nonpoint source pollution in variable landscapes. Key issues that should be considered in the development of regional temperature criteria include: sublethal thresholds; annual thermal requirements; thermal pattern, distribution, and connectivity; species distribution; thermal refugia; appropriate measurement units, and monitoring. The outcome of the effort may lead to criteria that are similar to current state temperature standards. Alternatively, recommendations may result in more substantial modifications to accommodate findings related to this project.

As EPA, the Services, states, and tribes will participate in this effort, it is an opportunity to reach broad agreement on the science as well as the structure and content of regional temperature criteria. This, in turn, will facilitate criteria adoption and implementation. Scientific consensus will also assist state-federal-tribal integration and implementation of other relevant water quality and species recovery programs. Technical approaches and frameworks will be applicable to criteria development for other water quality parameters as well as water quality restoration efforts. In this way, criteria development and thermal restoration, will move forward hand-in-hand.

Goal:

The goal of this effort is (a) to develop EPA regional temperature criteria that meets the biological requirements of listed salmonid species for survival and recovery pursuant to ESA and the Clean Water Act (CWA), and can be reasonably implemented; and (b) expected criteria adoption by EPA Region 10 Pacific Northwest states and tribes. The resultant criteria and associated products will be used by EPA, Region 10 as regional temperature criteria guidance to states and tribes and will be used by EPA to assess proposed revisions to temperature standards in the Pacific Northwest.

This effort will be a focused, systematic review and evaluation of existing information leading to the development of regional criteria reflecting key biological assessment and biological opinion findings as well as recommendations outlined by Oregon's Technical Advisory Committee, Temperature Subcommittee. Criteria adoption is the desired outcome.

Geographically diverse thermal regimes, hydrogeological constraints, zoogeography and salmonid life history patterns will be reviewed for criteria development. Regional criteria may include a combination of numeric, narrative, and diagnostic criteria as well as monitoring. Diagnostic criteria would reflect key processes and landscape features (see appendix and diagram 1). It is anticipated that some stratification process will be used to distinguish functions and processes within and between riverine systems. However, each basin may not receive unique criteria.

Framework for Work Completion:

The schedule for project development has been based on the absolute minimum of time required to address this complex issue. The project period will be May 1, 1999 to May 1, 2001.

Four groups will be established to complete project tasks:

A *technical workgroup* comprised of federal, state, and tribal officials (i.e., EPA, the Services, northwest state(s), and tribes) will develop the temperature criteria option(s) and associated work products. Development of products will be based on consensus with dissenting views recorded and submitted to the policy workgroup. The success of this effort will rely on the contributions of all technical workgroup members, operating as equal partners. It is therefore critical to the success of the project that dedicated staff time for the duration of the project be provided by all participating agencies.

A *peer review panel* consisting of individuals knowledgeable of temperature-salmonid interactions and having published in refereed journals will be assembled by the peer review panel contractor. Specific areas of expertise will include: fish physiology, aquatic ecology, hydrology, geomorphology, landscape ecology, historical reconstruction, and temperature modeling. This panel will provide peer review of interim and final written products. A contractor will be hired and will be responsible for establishing the peer review panel, selecting peer review panel members, scheduling meetings and developing meeting agendas, and providing direction as well as overall management of the panel. Peer review panel meetings will be advertised in the federal register and will be open to the public. EPA will be available to provide the peer review panel with historical context and technical clarification during scheduled meetings.

A detailed scope of work, as well as, selection of the peer review panel contractor will occur prior to the first technical and policy workgroup meeting (see task 1, step 1 below).

A *policy workgroup* comprised of federal, state, and tribal officials (i.e., EPA, the Services, northwest state(s) and tribes) will be charged with reviewing recommendations of the technical workgroup on the legal adequacy and feasibility of the proposed temperature criteria option(s), and selecting the regional temperature criteria to be used by EPA, states, and tribes. To ensure project continuity, policy workgroup members will attend interim and final project reviews conducted by the technical workgroup.

A *public network* comprised of interested public will be identified and facilitated sessions providing project updates and opportunities for public feedback will be conducted. Public network meetings will be scheduled throughout the region to ensure broad participation. To effectively manage this action, it must be made clear that the final decision regarding criteria acceptability lies with EPA, states, and tribes. Federal, state, and tribal officials will organize and facilitate public networking sessions. Specific roles and responsibilities of these officials must still be identified.

Tasks and Project Timeline:

Task 1: Develop EPA regional temperature criteria:

Task 1 will begin with a concerted effort to integrate existing interdisciplinary experience and scientific information into conceptual models that attempt to make predictions about the impacts of alternative policies (Walters 1999). This is intended to address (1) problem clarification, (2) alternative screening, and (3) identification of key knowledge gaps (Walters 1999).

The following areas will be reviewed and a synthesis and evaluation of findings will be developed:

1. Physiological and behavioral responses to thermal regimes.
2. Existing research portraying species distribution, pattern, and movement in relation to seasonal and annual thermal regimes.
 - Field data relating species presence/absence, densities, and productivity to temperature.
 - Studies related to community structure and the role of introduced and exotic species.
 - Information to assess beneficial use designations in relation to spatial and temporal variability and life history.
3. The role of landscape context, complexity, and connectivity in mediating thermal exposure.
 - Existing research linking species movements, thermal regime, and habitat usage.
 - Research characterizing thermal regimes in managed and unmanaged systems.
 - Variability at different spatial and temporal scales.
 - Landscape capacity or potential.

4. The development and use of zoogeographic and landscape stratification scenarios to facilitate understanding of physiological and behavioral responses of native salmonids to temperature as well as variability in thermal regimes.
5. Using thermal characterization data, identify situations where site-specific “anomalies” may occur as well as data requirements for interpretation of thermal variability associated with specific biophysical units. Data reflecting managed and managed systems within biophysical units will also be assessed.
6. Review information correlating measurement unit or statistic e.g., daily average, daily maximum with biological response and distribution parameters. Address issues of uncertainty related to effects thresholds.

Using the above information, develop temperature criteria option(s) and associated products including criteria to evaluate options, discussion of option(s) and the level of protection afforded as well as the implications for implementation, and development of a summary of the differing viewpoints for the policy committee.

Step 1:

Assemble technical and policy workgroup members. Review workgroup directives and establish a clear decision-making process. The technical workgroup will develop a schedule of future meeting dates and locations as well as a timeline for the completion of interim and final products including peer review and presentation of interim and final products to the policy committee. Additionally, a communication strategy for the public network sessions will be developed including facilitator selection, session location and number, participants, etc.

It is envisioned that the technical workgroup will meet two consecutive days per month during the initial stages of the project, followed by a writing and product development period where communication will be via conference calls and e-mail, and finally twice monthly meetings during the concluding stages of the project.

It is anticipated that six to eight meetings will be scheduled between the technical and policy workgroups. As most of the technical and policy workgroup members are in Oregon, we anticipate holding the majority of meetings in Portland and Corvallis. However, it is important that we have regional representation and therefore federal, state, and tribal officials from Montana, Washington, and British Columbia will also be invited to participate on the technical workgroup.

Step 2:

Each technical workgroup member will be responsible for reviewing a subset of the Task 1 topics listed on pages 3 and 4. An effort will be made by the technical workgroup to integrate existing experience and scientific information into conceptual models that attempt to explain both the biological effects of temperature on native salmonids as well as the spatial and temporal variability of the thermal environment. These models will be used to clarify existing processes and interactions at varying scales that lead to deleterious behavioral and physiological changes in

salmonids, identify key knowledge gaps, identify biological numeric and diagnostic criteria, and make predictions about the impacts of alternative criteria options.

Upon completing the reviews, the full workgroup will meet to evaluate written findings and recommendations prepared during the subtask reviews. Interim products including alternative conceptual models will be forwarded to the peer review panel contractor for panel review and recommendations. During this period, briefings for the policy committee will be scheduled.

The technical workgroup will be responsible for the: (1) the development of evaluation criteria to assess criteria options, (2) the development of temperature standard option(s) derived from the conceptual models - option(s) will be framed within a water quality standard format; (3) discussion of option(s) and the level of protection afforded as well as the implications for implementation; and (4) development of a summary of the differing viewpoints.

Potential evaluation criteria include: (1) protective of both migratory and resident forms and life history stages of native salmon and charr, (2) reflect annual thermal requirements including onset of warming and cooling trends, (3) measurement unit or statistic is biologically meaningful and protective, (4) monitoring design reflective of spatial and temporal variability of riverine temperatures, is both accurate and precise, and is linked to the biological requirements of salmonids, (5) elements linking the standard to the ecological context e.g., diagnostic indicators.

Draft products will be reviewed by the peer review panel and modifications will be made according to peer review panel recommendations and technical workgroup discussions. This package will be presented to the policy committee for their review and final selection of regional temperature criteria.

Task 2: Recommend appropriate monitoring and measurement approaches useful and pertinent to the temperature criteria project.

The following areas will be reviewed and a synthesis and evaluation of findings will be developed:

1. Review temperature data collection protocols for accuracy and precision.
2. Recommend a measurement unit and monitoring protocol.

Based on information gathered during Task 1, as well as, peer review panel comments of interim Task 2 products, the technical workgroup will recommend appropriate monitoring and measurement approaches. This task is not intended to produce a comprehensive regional monitoring strategy. Rather, the recommendations will be useful and pertinent to the regional temperature criteria project and its successful implementation.

Task 3: Develop linkages between regional temperature criteria and thermal restoration.

Temperature criteria and thermal recovery are fundamentally linked by the physical processes that shape and maintain temperature in the landscape. Using conceptual models developed in Task 1, the technical workgroup will develop an influence diagram to characterize key processes and landscape elements responsible for shaping the thermal environment (see diagram 3). This diagram will be used to assess

critical processes controlling temperature, assess land use and management actions that affect these processes, and identify effective and efficient actions for short and long-term thermal recovery. A narrative will be developed explaining use of the diagram including its use in identifying appropriate actions for thermal recovery. The peer review panel will provide review of the influence diagram. Peer review panel recommendations as well as technical workgroup discussions may lead to diagram modifications.

Additionally, a catalog of research and information related to temperature will be developed and made available via an EPA web site.

Task 2 and 3 products will be presented to the policy committee.

Task 4: Identify critical research needs and data gaps.

The technical workgroup will use the best information available to complete the temperature criteria project. However, it is probable that we will identify areas for study as well as data needs that will facilitate our future understanding of temperature/salmonid interactions.

Task 5: Selection of EPA regional temperature criteria.

Temperature criteria option(s) and related work products will be presented to the policy committee for decision-making. The policy workgroup will review recommendations of the technical workgroup and will select regional temperature criteria to be used by EPA, states, and tribes. The selection process will be based on evaluation criteria developed by the policy workgroup. All decisions regarding criteria selection including the criteria and evaluation process will be recorded.

Reference:

Walters, C. 1999. Challenges in adaptive management of riparian and coastal ecosystems. *Con. Ecol.* Vol 1(2).

Resource Estimates:

- (1) EPA:
 - Office of Ecosystems: Cara Berman (approx. 75%)
 - Office of Water: Dru Keenan (approx. 40%)
 - Office of Environmental Assessment: Geoff Poole, Scott Augustine - GIS (20%)
 - Policy Committee Representative: Jim Werntz, Office of Water (15%)
- (2) Contract:
 - EPA Headquarters Peer Review Funds: \$45,000 (current amount)
 - Additional Peer Review Panel Requirements: \$50,000/yr (requested)
 - Facilitation and logistics: \$25,000/yr (requested)
- (4) Research:
 - USGS/CSS temperature data analysis: \$50,000 (requested)
 - Field and laboratory studies to support temperature criteria development:
 - Oregon State University and Montana State University: \$ 100,000 (requested)
- (5) Oregon Department of Environmental Quality:
 - Technical workgroup and policy committee representatives
- (6) U.S. Fish and Wildlife Service:
 - Technical workgroup and policy committee representatives
- (7) National Marine Fisheries Service:
 - Technical workgroup and policy committee representatives
- (8) Tribes (NWIFC, CRITFC):
 - Technical workgroup and policy committee representatives
- (9) Washington Department of Ecology:
 - Technical workgroup and policy committee representatives
- (10) Idaho Department of Environmental Quality:
 - Technical workgroup and policy committee representatives

Initial Model for Discussion (Appendix: Include with Diagrams):

Past criteria efforts have not directly addressed issues of natural variability and variations in thermal regimes within different biophysical contexts. Collection of multiple temperature data points without an interpretive context makes evaluation of thermal regimes and their effect on aquatic biota very difficult. The elements of numeric criteria, narrative criteria, diagnostic criteria, and monitoring will reflect biological needs as well as landscape capacity and variability thereby providing an interpretive context. Zoogeographic and biophysical stratification allows one to compare and contrast variability across landscapes. Biophysical units such as ecoregions (Omernik) may be based on geology, physiography, vegetation, climate, soils, hydrology, wildlife, and land use. Without appropriate stratification and clustering of biophysical units, there is no context for interpretation of measurements. Stratification allows one to make statements regarding: a) native assemblages and communities, b) successional states and rates of recovery, c) adaptation to frequency, intensity, and type of disturbance events, d) system response to anthropogenic disturbance, and e) inherent capacity or potential. These are critical to the discussion of temperature and regional criteria and will be the foundation of this model..

As illustrated in Diagram 1, zoogeographic and landscape stratification scenarios will be developed to facilitate understanding of physiological and behavioral responses of native salmonids to temperature as well as variability in thermal regimes. Within stratification units, biological requirements of salmonids including species distribution, pattern, and movement in relation to annual thermal regimes will be compiled and numeric criteria by life history stage developed. Issues of uncertainty related to effects thresholds will be recorded and measurement units developed. In addition, potential refugia and sources areas will be identified and protected and antidegradation policies implemented. Diagnostic criteria used to support and interpret numeric criteria will be established in conjunction with a monitoring plan to be used to refine diagnostic criteria over time. All criteria will be tiered to biophysical units and will reflect higher order processes, patterns, and structures necessary to support native salmonids. Possible diagnostic criteria include those processes that define and reflect characteristic thermal regimes (e.g., biological pattern and structure, hydrological processes, anthropogenic disturbance processes, thermal environment pattern and structure). Examples of diagnostic criteria are provided in Diagram 1. In the future, diagnostic criteria for temperature and habitat may be integrated to identify key processes and landscape elements that are driving thermal and physical habitat patterns, distribution, and connectivity. However, diagnostic criteria should be developed for specific biophysical units and at the appropriate scales for the criteria to be relevant.

Diagnostic criteria development will focus on higher order processes related to the extent, pattern, distribution, and connectivity of the thermal environment while numeric criteria will reflect biological requirements. Regional temperature criteria will define the context within which finer scale issues will be addressed. To this end, the regional criteria approach will establish a hierarchical framework allowing one to “step down” in scale to review finer scale issues and higher resolution data as one moves down in scale. Without such a framework, interpretation of temperature data may occur at smaller scales without being informed by the larger context, thereby leaving a patchwork of disconnected regulatory measures.

Technical Workgroup

Technical Workgroup

Cara Berman, EPA (Dru Keenan, EPA)
Jeff Lockwood, NMFS
Cathy Tortorici, NMFS
Elizabeth Materna, USFWS
Debra Sterdevant, ODEQ

Candidates for the Technical Workgroup

Dale McCullough, CRITFC
Jim Winton - USGS, Biological Services Division (Heat Shock Proteins)
Sally Sauter - USGS (smoltification)
Bob Bilby, George Pess, Peter Kefnee - NMFS (Montlake Lab)
Pete Bisson - USFS
John Barlow, Fort Collins, USGS * also, modeling
Bruce Rieman - USFS, Rocky Mountain Research Station
John Van Sicle, EPA, Corvallis Lab
Matt Boyd, OR DEQ
Carl Schreck - USGS, BSD (stress response)
Hiram Li - USGS, BSD